POLITECNICO
MILANO 1863

MSc in Computer Science and Engineering

Software Engineering 2 Project

TrackMe Requirement Analysis and Specification Document

Submitted To:
Elisabetta di Nitto
Professor
Computer Science Department

Submitted By :
Andrea Biscontini - 000000
Marco Gelli - 000000
Alvise De Faveri - 000000

Contents

1 Introduction

prima dei sottocapitoli

1.1 Purpose

This document represent the Requirement Analysis and Specification Document of the Data4Help system. Here it's described the general purpose of the system, the functional and non-functional requirements that it must respect and the assumption through which we achieve all it's goal. This document is addressed to all the stakeholder of this system, which means final clients but also management, developer, testers and more.
The Data4Help system is composed by an user side smartphone Application and a web based query service for the third parties. The user-side App has the task to collect data from all the devices connected to the user's smartphone and send them to the TrackMe database. The web service is instead used by third parties to submit data request to TrackMe and, if they are successful, receive the most recent data collected on the proprietary databases. AutomatedSOS is instead an user-side integration for the Data4Help service. Registered users' real time data are here monitored and, if there is any signal of possible health problems, local emergency numbers are called and an ambulance is called to intervene at the customer location. Track4Run isanother ananotheranotheranotheranotherother system built upon Data4Help. Here users can become run organizers, enroll in scheduled runs and spectate live runs through a map with live GPS ranotheranotheranotherunners position.

1.2 Scope

1.2.1 Description of the given problem

As stated in the above section, Data4Help main goal is to collect user's data and made them available to third parties, all while guaranteeing the user privacy and consensus in personal data processing. To collect these data, the system needs to connect to users' smartwearables and download all the relevant produced data to TrackMe proprietary servers. Then this data are processed by TrackMe and whenever a request for data arrives from the third parties, if the request is successful, they're made available to them. Third parties could also desire to look for future changes in the data they requested, so an auxiliary subscription to new data is also made available at request time. Other than that, to simplify the data request procedure, this has been divided in two types of request: single user data request, that is forwarded directly to the individual that can accept or refuse it, and request for anonymized data of groups of individual, that is handled by TrackMe and it's always successful if there is the possibility to render the data anonym. On top of the Data4Help system, that is used mainly by third party as a data retrieving service, there are AutomatedSOS and Track4Run. These service are instead to be used by an user of Data4Help. AutomatedSOS means is to help elderly or non-healty people to monitor their health status and intervene in the case of an emergency. In fact the goal of AutomatedSOS is to be very reactive (maximum 5 seconds) whenever a possible health problem is signaled and to immediately call emergency number and an ambulance for the location of the client. Track4Run is instead a system designed for athletes and runners in which it's possible to organize, partecipate and spectate organized running competitions. Here any user can become the organizer of a run by creating one. The run creation procedure here is made really simple for the organizer, who needs only to insert the needed infos and select a route for the run on the map. When a run is created, every other user can enroll to it. To give an even better service, there is also the possibility to spectate a run on the App, which means follow every runner's position on a live GPS map.

The whole system ....

1.2.2 Current System

1.2.3 Goals

- **G1** Data4Help must be able to keep track of real time health status and position from registered users
- **G2** Data4Help should allow third parties to gather information from a single user or from an anonymous group of users
- **G3** Data4Help should allow third parties to subscribe to new data and receive them as soon as they're produced
- **G4** AutomatedSOS should be able to identify an health emergency when the user data are below/exceeding a certain thresholds
- **G5** AutomatedSOS must call an ambulance when it detects a health emergency
- **G7** Track4Run allows a user to become an organizer of a run, so that he/she can create and manage a run
- **G8** Track4Run allows a user to partecipate to an organized run
- **G9** Track4Run allows a spectator to track the position of the partecipants of a run

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

1.3.2 Acronyms

- **D4H**: Data4Help
- **ASOS**: AutomatedSOS
- **T4R**: Track4Run
- **RASD**: Requirement Analysis and Specification Document
- **API**: Application Programming Interface
- **GPS**: Global Positioning System

1.3.3 Abbreviations

Gn : n-th goal

Dn : n-th domain assumption

Rn : n-th functional requirement

1.4 Revision history

quattro

1.5 Reference Documents

cinque

1.6 Document Structure

sei

2 Overall Description

Here you can see how to include an image in your document.

Here is the command to refer to another element (section, figure, table, ...) in the document: *As discussed in Section 1.6 and as shown in Figure 1, ...* Here is how to introduce a bibliographic citation [**?**]. Bibliographic references should be included in a `.bib` file.

Table generation is a bit complicated in Latex. You will soon become proficient, but to start you can rely on tools or external services. See for instance this https://www.tablesgenerator.com.

2.1 Product perspective

2.2 Product functions

2.2.1 User Data Acquisition

2.2.2 User Data Retrieval

2.2.3 Health Emergency Monitoring

2.2.4 Run Events Management

2.3 User characteristics

2.3.1 Actors

- Data4Help User
- Third Party
- Data Source Application
- Ambulance system
- Run organizer
- Run spectator
- Runner
- Sys Admin

2.4 Assumptions, dependencies and constraints

2.4.1 Domain Assumptions

2.4.2 Software dependencies

Software dependencies: Maps, ambulance API

2.4.3 Hardware constraints

Server(?), Smartphone/Smartwear/smartdevices, GPS, 4G, sensors

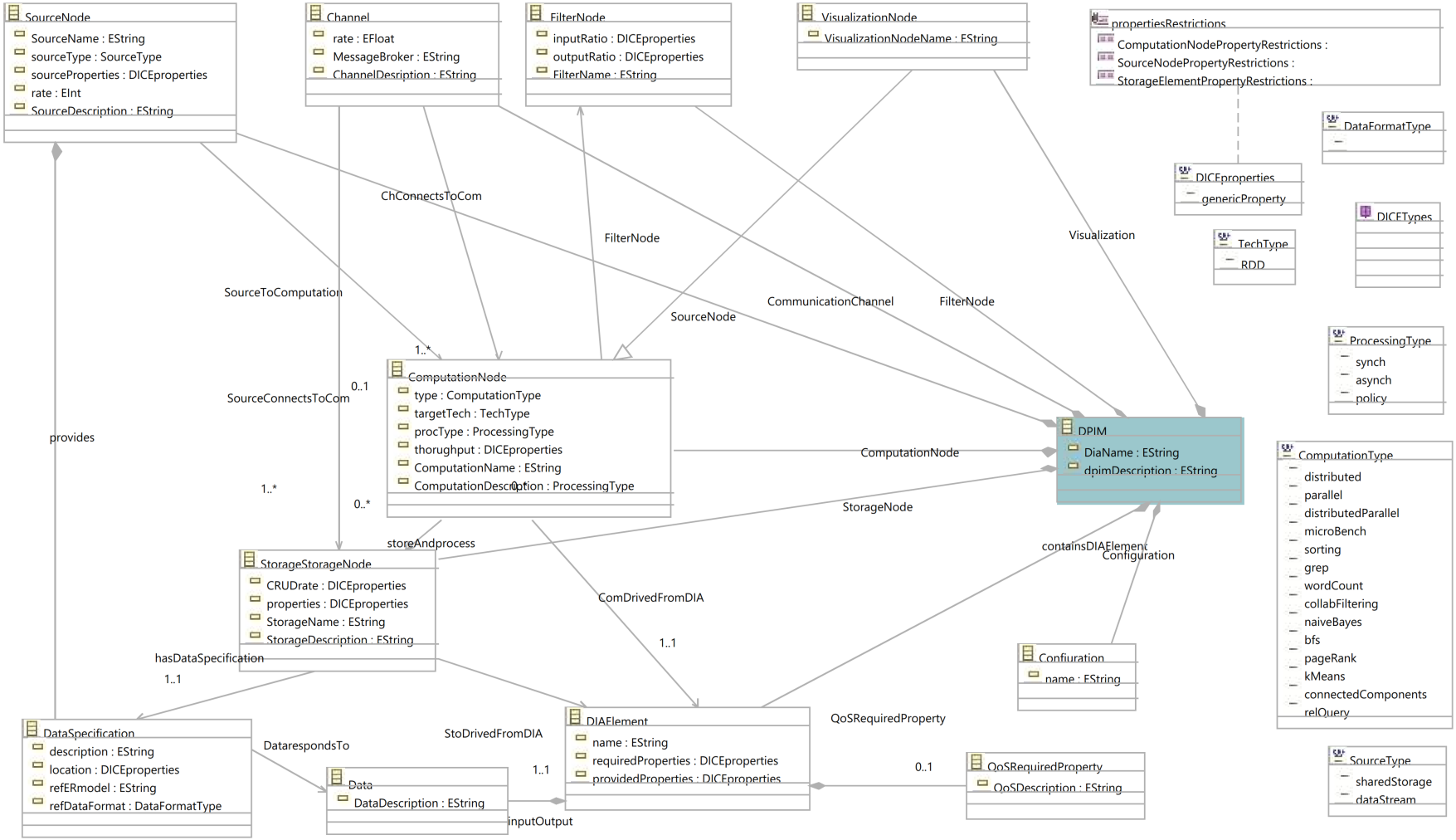

Figure 1: DICE DPIM metamodel.

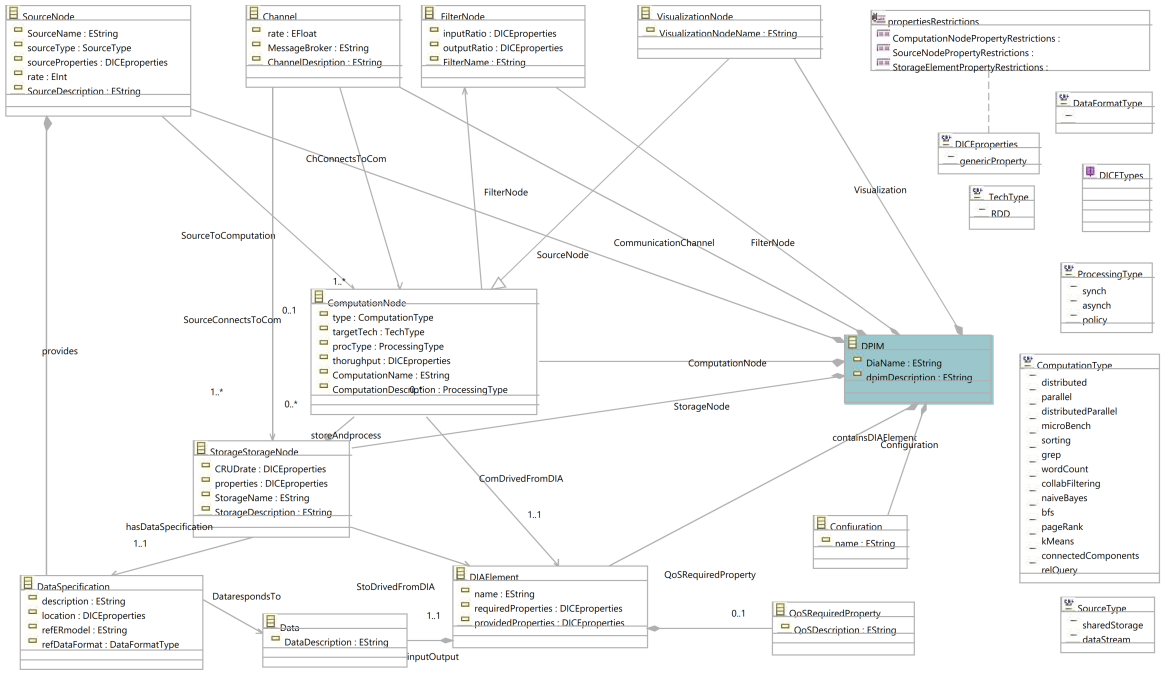

Figure 2: DICE DPIM metamodel in portrait form.

3 Specific Requirements

Organize this section according to the rules defined in the project description.

3.1 External Interface Requirements

3.1.1 User Interface

mockup

3.1.2 Hardware Interfaces

none

3.1.3 Software Interfaces

Data acquisition and data retrieval

3.1.4 Communication Interfaces

REST API, TCP/IP, HTTPS

3.2 Functional Requirements

GG Data4Help allows the user to examine all his/her collected data

[G1] Data4Help must be able to keep track of real time health status and position from registered users' devices

- **R1** A user can register to TrackMe's services providing a Fiscal code and a password of their choice
- **D1** Fiscal code uniquely identifies a user of the system
- **R2** After registration, a user can log in by using his/her credentials
- **R3** The system acquires user data only after he/she accepted the data acquisition policy
- **D2** Every user owns at least one device capable of retrieving correct real-time health parameters and location
- **D3** User devices must grant to the system access to the requested data
- **D4** User devices must be continuously connected to the internet

G2 Data4Help should allow third parties to gather information from a single user or from an anonymous group of users

- **R4** Third parties can register to Data4Help by providing a VAT code
- **D5** VAT code uniquely identifies a third party in the system
- **R5** The system provides to the registered third parties unique access tokens to use the services
- **R6** The system grants access to a single user data only after his/her confirmation
- **D6** Third parties know the monitored user Fiscal Code
- *R7 The system is capable of merging multiple user data and anonymize it*

- **R8** The system shall grant access to merged data only if the number of individuals whose data satisfy the request is higher than 1000.

G3 Data4Help should allow third parties to subscribe to new data and receive them as soon as they're produced

- **G4** AutomatedSOS must use data coming from Data4Help to monitor the health condition of its users
- **G5** AutomatedSOS should be able to identify an health emergency when the user data are below/exceeding a certain thresholds
- **G6** AutomatedSOS must call an ambulance when it detects a health emergency
- **G7** Track4Run allows a user to become an organizer of a run, so that he/she can create and manage a run
- **G8** Track4Run allows a user to partecipate to an organized run
- **G9** Track4Run allows a spectator to track the position of the partecipants of the run

3.3 Scenarios

3.3.1 Scenario 1

While talking, John tells his friend Matt about a new service called Data4Help that helps you keeping track of your health status. Frank, interested in checking his heart rate, downloads the app on his smartphone and fires it up. The app asks him to register to the service by filling a form with his personal information, including his fiscal code and a password of his choice that will be used as credentials for the login. After filling the form he clicks on the final checkbox to accept the personal data treatment policy. Right after clicking on the "Submit" button, Frank receives a notification saying he successfully registered to Data4Help.

3.3.2 Scenario 2

Mary, a Data4Help customer, received for her birthday the new Eppol iClock. After the initial setting of the device, she decides to download the Data4Help application for her smartwatch. Once installed, she logs in with her accountand right after that, the "Device Management" view of the application appears. Mary taps on the iClock icon and by selecting "Heart Rate" from a dropdown she assigns the tracking of that paramater to her smartwatch. With the same procedure, she assigns to her smartphone the tracking of the "Position" parameter. Finally, she clicks on the "Confirm" button and the app saves the settings and returns back to the home page.

3.3.3 Scenario 3

Steve, a Data4Help customer with diabete, needs to periodically check the glucose levels observed by his medical device connected with the Data4Help application on his smartphone. For doing this, he starts the Data4Help application and when the homepage shows up he clicks on the "myData" tab. A nice view appears, containing all the information about his monitored health parameters with a lot of colorful diagrams. Steve filters out the displayed content by selecting the "Glucose Level" radio button on the top of the page and he changes the information granularity from "Week" to "Day" using a dropdown.

3.3.4 Scenario 4

Michael Garcia, Boyer Pharmaceutical CEO, heard about the Data4Help service and in agreement with the Administrative Board, he decided to introduce it in the company. He visits www.trackme.com/data4help and clicks on the "Business Solutions" section in order to register his company as a registered third party of the service. To do this, Michael fills in the registration form with all the requested information about the company, including the VAT-number, an e-mail and a password. After that he clicks on the "Submit" button and he immediately receives an e-mail with a link to complete the registration procedure.

3.3.5 Scenario 5

Brian, patient of the Lenox Private Medical Center, was released yesterday. The clinic, registered to the Data4Help service, decides to monitor his health status to see if the treatment he was under reached the desired results. The doctor that was in charge of Brian logs in to the Data4Help reserved page of the clinic. Once logged in, he inserts Brian's fiscal code and selects from a checkbox "Heart Beat" and "Temperature" as the data to monitor. Finally he chooses from a dropdown "3 months" as the observation period. As soon as the doctor clicks on the "Send Request" button on the bottom of the page, Brian receives a notification on his smartphone. He launches the application and when the home page shows up he taps on the "Incoming Requests" tab. Here he sees the request coming from Lenox Private Medical Center. He briefly reads the description and he clicks on the "Accept" button. A confirmation e-mail, saying the patient accepted the treatment of his personal data, is immediately sent to Lenox Private Medical Center. The doctor sees the e-mail and goes in the "Sent Requests" section of the Data4Help personal page of the company. After clicking on Brian's answer, all the requested data are displayed on screen.

3.3.6 Scenario 6

Pfuzer, a big pharmaceutical company registered to Data4Help service, needs to gather the heart rate data of all the italian young people under 30 years old for a market analysis aimed at evaluating the production of a new drug against heart disease. For this reason Todd Chavez, the marketing manager of the company, goes to the Pfuzer personal Data4Help page and once logged in he clicks on the "Aggregated requests" tab in the home page. Once in the page he types in the textbox "Italy" as location, and selects the age range "<= 30" using a slider. Then he clicks on "Send request" on the bottom of the page and a warning message is immediately displayed on screen saying that the request cannot be satisfied. For this reason, Todd decides to untighten the search parameters. After changing them the constraints are satisfied and the requested data is immediately displayed on screen.

3.3.7 Scenario 7

Andrew decided to buy the new iClock as a gift for the birthday of his grandfather Leonard, 93 years old, who suffers from severe heart problems and lives alone. Since Leonard would like to be autonomous, his new device with AuotmatedSOS service active on it, grants him a safer life.

One night Leonard wakes up with severe chest pains. The iClock immediately detects the "heart rate" parameter exceeded the maximum threshold and shows a noisy emergency alert, saying that an ambulance will be called if the user doesn't abort in the following minute. Leonard is really sick and is not able to abort the operation. In few minutes an ambulance arrives and Leonard is immediately rescued.

3.3.8 Scenario 8

William suffers from epilepsy. The attacks are not very frequent but they are so strong that a few months ago he fell and he got a nasty head injury. While looking for an automated solution to check on his conditions, he hears about AutomatedSOS and decides to activate the service provided by Data4Help.

At first he sets the threshold of the tracked parameters with the help of his doctor and he adds the contacts of his parents. When the wristwatch detects repetitive shaking motion, it automatically sends the user's bluetooth-connected phone text and call alerts to the designated recipients. Within seconds, family members receive these alerts, which include the date, time and GPS location of the event.

3.3.9 Scenario 9

Virgin Active is organizing a run for all his customers. Luke, company's event manager, is thinking about using the Track4Run Service to accomplish this task. He logs into the company dedicated web page and he clicks on the Track4Run tab and then on "Create Run".

At this point a configuration frame shows up. Luke starts by filling out the "Basic info" section of the form: he adds the event name, an image, the location and the starting and ending time. Then he goes on by filling out the "Details" section in which he provides a short description of the event and the maximum number of participants. Finally, by clicking on a map, he marks all the checkpoints of the run.

After a quick check, Luke clicks on the "Create" button and a confirmation alert appears saying that the event has been successfully published in the news feed.

3.3.10 Scenario 10

Chris, runner and Data4Help customer, is looking for a run to join. By looking at the news feed of Track4Run on his smartphone he sees the event created by Virgin Active. He taps on the event name and the full description of the event shows up. After reading the description and all the details he decides to join the run, hence he clicks on the "Participate" button. A confirmation alert shows up, saying that the event has been added to the attending events.

3.3.11 Scenario 11

Katy, Chris' wife and Data4Help customer, wants to go cheer his husband at the run. The day of the run she launches the Data4Help application and in the Track4Run section she taps on the "Ongoing Runs" button. Katy selects the desired run and a nice map with a the GPS position of all the athletes opens up. In order to see the details of the husband she types in a textbox her husband name and press the "Filter" button. After that on the map is shown only the position of his husband followed by the his timing performances, the heart rate and the calories burnt.

3.4 Use Case

3.5 Performance Requirements

5 seconds react time

3.6 Design Constraints

3.6.1 Standard compliance

GDPR (general data protection regulation), term of service...

3.6.2 Hardware limitations

3.6.3 Any other constraint

3.7 Software System Attributes

3.7.1 Reliability

up 24/7

Name	User registration
Actor	User
Entry conditions	App installed on user's device (and run while not logged in?)
Events flow	1. Click on the "Subscribe" button 2. Fill the registration form and the account credentials 3. Accept the terms of service and the privacy policy 4. Click on the "Submit" button 5. The system elaborate the registration and send back a notification
Exit conditions	Registration is successful and the user is informed via notification
Exceptions	1. The user is already registered 2. There is some invalid data in the form 3. The email is already used 4. Terms of service or Privacy policy haven't been checked All the exceptions take the user back to the registration procedure

Name	User log in
Actor	User
Entry conditions	App installed on user's device and user already registered to Data4Help
Events flow	1. Click on the "Log in" button 2. The user enter his/her credentials 3. Click on the "Enter" button 4. The log in was successful and the user is redirected to the home page of the App
Exit conditions	The log in is successful and the user is redirected to home page
Exceptions	1. Credentials aren't valid The exceptions are notified to the user and the Log in procedure restart

Name	Device Management
Actor	User
Entry conditions	User enter in the "Device Management" pannel of the App
Events flow	1. The list of devices connected to the account is shown 2. The user select which device to configure 3. For that device, the list of all the possible parameter that it can track is shown 4. The user turn On/Off the tracking of each parameter 5. Click on the "Confirm" button
Exit conditions	The user have set his/her preference and saves them
Exceptions	1. the parameter is already tracked from a more reliable source (maybe??)

Name	MyData
Actor	User
Entry conditions	User enter in the "MyData" tab of the app
Events flow	1. The system shows all the user gathered info 2. A top bar is presented to the user to filter the search 3. Whenever a filer is changed the app respond with the filtered information
Exit conditions	The user exit the information tab
Exceptions	1. the system haven't gathered any info yet The exceptions are notified to the user and the MyData page is shown with the available data

Name	Third Party Registration
Actor	Third Party
Entry conditions	The third party clicks on "Business Solutions" on www.trackme.com/data4help
Events flow	1. Click on the "Register" button 2. Fill the form with information regarding the company 3. Click on the "Submit" button
Exit conditions	Registration is completed and a notification is sent via e-mail
Exceptions	1. Company already registered 2. email already in use All the exceptions are notified and the procedure goes back to registration

Name	Third Party Log in
Actor	Third Party
Entry conditions	The third party goes on www.trackme.com/data4help and click "Log in"
Events flow	1. Click on the "Log in" button 2. Enter the company credentials 3. Click on the "Enter" button
Exit conditions	Log in is successful and the client is redirected to its reserved page
Exceptions	1. Credentials aren't valid The exceptions are notified to the client and the Log in procedure restart

Name	Single Data Request
Actor	Third Party, User
Entry conditions	A third party client is logged in and goes under "Single Data Request"
Events flow	1. Click on "Single Data Request" 2. Insert the fiscal code of the person whose data are requested 3. Check which data to monitor form a checklist 4. Select the observation period 5. Click on "Send" button 6. The request is notified to the user 7. The user logs into the App and goes under "Incoming Request" 8. The user select whether or not to accept the request 9. The result is notified via e-mail to the third party 10. If the user accepted, the information are made available under the "Sent Request" section of the Data4Help personal page of the company
Exit conditions	The user has responded to the request and, if successful, the data are made available to the third company
Exceptions	• The observation period covers a time period in the future This exception launches the subscription procedure 1. No user found that correspond to the search 2. The user refuse the request This exception is notified to the third party and the request ends

Name	Aggregate Data Request
Actor	Third Party, Data4Help (maybe?)
Entry conditions	A ttesthird party client is logged in and goes under "Aggregate Data Request"
Events flow	1. Click on "Aggregate Data Request" 2. Insert the location of the data 3. Select the age range 4. Customize any other filter on the data 5. Click the "Send request" button 6. The request is elaborated throught the Anonym? procedure 7. On request successful, the data are made available uder the "Sent Request" section of the Data4Help personal page of the company
Exit conditions	The request was successful and the data are made available to the third company
Exceptions	• An observation period is selected and it covers a time period in the future This exception launches the subscription procedure 1. Anonym? returns request rejected due to lack of anonymity The exception notifies the third party on reasons of the rejection and returns to the Aggregate Data Request page

Name	Data Subscription
Actor	Third party
Entry conditions	A request, for single or aggregate data, has been made with an observation period that extend in the future
Events flow	1. If the request is successful, the third company is updated about the changes in the data that it requested
Exit conditions	The observation period elapses and the subscription end
Exceptions	1. Data aren't available anymore The exception are notified to the client via e-mail

Name	Anonym?
Actor	Data4Help
Entry conditions	Data4Help recives a request for aggregate data and the system algorithm anonymize the data
Events flow	1. An aggregate request arrives at Data4Help 2. The anonymization algorithm launches on the available data 3. It return the anonymized data to be seen by the third party
Exit conditions	The data were successfully anonymized by the algorithm
Exceptions	1. The available data are scarce (<=1000) hence the anonymization is impossible This exception notifies the third party that its request has been rejected

Name	AutomatedSOS Subscription
Actor	User, AutomatedSOS
Entry conditions	User enters in the "AutomatedSOS" pannel under the App
Events flow	1. Click on "Subscribe" 2. Configure the settings 3. Accept clauses 4. Start Supervisor
Exit conditions	The user has subscribed to the service and the Supervisor starts
Exceptions	1. User cannot access to the service due to lack of devices that can track his/her real time status The exceptions are notified to the client that is brought back to the AutomatedSOS panel

Name	Supervisor
Actor	AutomatedSOS, User, Third party (emergency)
Entry conditions	The user has subscribed successfully to the AutomatedSOS service and his/her supervisor has started
Events flow	1. Monitor real time data 2. Check for threshold constraint 3. Repeat
Exit conditions	User unsubscribe from the AutomatedSOS service
Exceptions	• Some parameter went over its threshold This exception notifies the client and AutometedSOS system proceed to call emergency numbers 1. Lost device for data acquisition This exception notifies the client and pause the Supervisor until the problem is fixed

Name	Run enroll
Actor	User, Track4Run
Entry conditions	User enters in the "Enroll" panel, under the "Track4Run" tab in the App
Events flow	1. Choose from a list to which run to enroll 2. Click on the "Enroll" button 3. Accept the clauses 4. Process the enrollment and start the Tracker
Exit conditions	The user has successfully enrolled to the run and the Tracker started running
Exceptions	1. The user doesn't possess a device able to Track the runner 2. The user is in a bad shape for a run, medical advice is suggested This exceptions is notified to the client and the procedure goes on

Name	Tracker
Actor	Track4Run, User,
Entry conditions	The user has enrolled for a run
Events flow	1. Stay on idle till starts of the run 2. On wake up, keep track of real time location of the user
Exit conditions	The run ends and the Tracker leave the user
Exceptions	1. Lost device for real time location This exception is notified to the client and the procedure goes on 1. User unsubscribe form the Run This exception kills the Tracker and remove the user from the run

Name	Run "unsubscription"
Actor	User, Track4Run
Entry conditions	User already enrolled on a Run and he/she want to unsubscribe
Events flow	1. Look up under "Your Runs" tab for the desired run 2. Click on the "Unsubscribe" button 3. Notifies the Tracker
Exit conditions	User has successfully unsubscribed from the run
Exceptions	?

Name	Watch Run
Actor	User (Spectator), Track4Run, Users (Runners)
Entry conditions	A spectator goes under the "Live" section of Track4Run and select an ongoing run
Events flow	1. Select a Run form the list of ongoing runs 2. Enter information about the desired runner 3. Watch the map of the run with the real time GPS tracking of the searched runner
Exit conditions	Run ends or spectator exit from the live page
Exceptions	1. Runner has connection problems 2. Spectator has connection problems 3. Server has connection problems All exception are notified to the spectator and the process goes on

Name	Create a Run
Actor	User (Organizer), Track4Run
Entry conditions	The organizer goes under the "Create Run" panel of the Track4Run section of the App
Events flow	1. Click on the "Create Run" button 2. Enter information about the run 3. Select the run path from the map 4. Click on the "Create" button
Exit conditions	The organizer has successfully created a run
Exceptions	?

Name	Run modification/cancellation
Actor	User (Organizer), Track4Run
Entry conditions	The organizer goes under the "Your Run" panel of the Track4Run section of the App
Events flow	1. Select the run you want to modify 2. Modify the information of the run 3. Modify the path of the run from the map 4. Select whether to cancel or not the run 5. Click on the "Confirm" button
Exit conditions	The organizer has successfully modified or canceled the run
Exceptions	On success, notifies all the partecipants about the changes

3.7.2 Availability

3.7.3 Security

3.7.4 Maintainability

3.7.5 Portability

4 Formal Analysis Using Alloy

Organize this section according to the rules defined in the project description.

5 Effort Spent

Provide here information about how much effort each group member spent in working at this document. We would appreciate details here.

6 References

References